

What is claimed is:

1. A method of applying solvents for the removal of polymer from exposed surfaces, comprising the steps of:

providing a substrate, at least one point of electrical contact having been provided in or on the surface of said substrate, said at least one point of electrical contact comprising copper;

depositing an etch stop layer over the surface of said substrate;

depositing at least one layer of dielectric over the surface of said etch stop layer;

creating at least one opening through said at least one layer of dielectric provided over the surface of said etch stop layer, said at least one opening having sidewalls and a bottom surface;

removing said etch stop layer from said bottom surface of said at least one opening, exposing the surface of said at least one point of electrical contact having been provided in or on the surface of said substrate, said removal of said etch stop layer causing accumulation of polymers over exposed surfaces;

applying a first plasma treatment to exposed surfaces comprising the surface of said at least one layer of dielectric and to said sidewalls of said at least one opening created through said at least one layer of dielectric and to said exposed

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surface of said at least one point of electrical contact having been provided in or on the surface of said substrate;

applying a DI water (DIW) rinse to said exposed surfaces;
and

applying a second plasma treatment to said exposed surfaces.

2. The method of claim 1, said first plasma treatment providing chemically interaction with said accumulated polymer deposits, thus enabling the removal of the polymer residues.

3. The method of claim 1, byproducts of said first plasma treatment being water soluble.

4. The method of claim 1, said first plasma treatment not causing damage to exposed surfaces of said at least one layer of dielectric deposited over the surface of said layer of etch stop layer.

5. The method of claim 1, said first plasma treatment being selected from the group consisting of N₂/O₂ based plasma treatment and N₂/H₂ based plasma treatment and O₂ based plasma treatment and N₂ based plasma treatment and H₂ based plasma treatment.

6. The method of claim 5, said N_2/O_2 based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing N_2/O_2 at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

7. The method of claim 5, said O_2 based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing O_2 at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

8. The method of claim 5, said N_2/H_2 based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing N_2/H_2 at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor

and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

9. The method of claim 5, said N₂ based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing N₂ at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

10. The method of claim 5, said H₂ based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing H₂ at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

11. The method of claim 1, said at least one layer of dielectric deposited over the surface of said etch stop layer comprising low-k dielectric.

12. The method of claim 1, said second plasma treatment being sensitive to removing copper oxide.

13. The method of claim 1, said second plasma treatment being sensitive to not chemically interacting with said at least one layer of dielectric deposited over the surface of said etch stop layer.

14. The method of claim 1, said second plasma treatment being a H₂ based plasma treatment.

15. The method of claim 14, said H₂ based plasma treatment comprising applying isotropic plasma etching in an etchant comprising nitrogen, performed in a parallel HDP reactor in-situ, in a plasma containing H₂ at a flow rate of between about 30 and 60 sccm, in an organ carrier gas at a flow rate sufficient to maintain a pressure between about 5 and 15 mTorr said HDP reactor and at an rf power of between about 400 and 1,200 Watts TCP and between about 1,000 and 1,500 Watts bias.

16. The method of claim 1, said etch stop layer deposited over the surface of said substrate comprising a material selected from

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the group consisting of nitride and carbide and composite films
such as oxide/carbide and oxide nitride.